

100
 PARTS: wt. is mixed with an optically cationic polymerization initiator such as a diaryl iodonium salt to prepare this composition for paper coating which is cured with active energy rays such as from a mercury lamp. This composition

CONSTITUTION: A compound having 1-4 oxetane rings in an amount of

PURPOSE: To provide an active energy-curable type of resin composition for paper coating, which mainly comprises a specific oxetane ring-containing compound, thus shows a rapid curing rate and gives a coated layer having gloss, scuff resistance and flexibility.

ABSTRACT:

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PUBN-DATE: August 27, 1996
 TITLE: ACTIVE ENERGY BEAM-CURABLE COMPOSITION FOR PAPER COATING

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may be combined additionally with an alicyclic epoxy compound, a vinyl ether such as hydroxyethyl vinyl ether, a compound bearing (meth)acryloyl groups such as a (meth)acrylate ester of phenol, nonylphenol or ethyl hexanol and a photoradical polymerization initiator such as a benzoyl alkyl ether.

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(54) 【発明の名称】 紙張用活性炭エネルギー平一酸化亜鉛組成物

(57) 【要約】

【目的】 酸化性に優れ、又その濃度が光沢を有し、さらに消臭性、耐擦傷性及び耐候性に優れる紙張用のための活性炭エネルギー平一酸化亜鉛組成物の提供。
【構成】 1〜4箇のオキセタン環を有する化合物及び光カチオン重合開始剤からなる紙張用活性炭エネルギー平一酸化亜鉛組成物。

アルキル基、又はアリール基である。mは、0～100

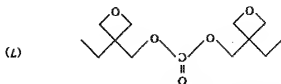
* 梅等が挙げられる。

【0020】

の整数である。2個のオキセタン環を有する化合物の具

体例としては、下記式(7)及び(8)で示される化合*

【化7】

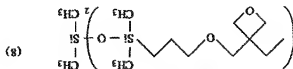


【0021】式(7)で示される化合物は、式(2)に

10※【化8】

化合物である。

※



【0023】式(8)で示される化合物は、一般式

(2)において、R¹がエチル基、R²がメチル基、R³が

及びR⁷がメチル基、mが1である化合物である。

【0024】2個のオキセタン環を有する化合物におい

て、上記した化合物以外の好ましい例としては、下記一

般式(9)で示される化合物がある。式(9)におい

て、R¹は、前記一般式(1)におけるものと同様の基

である。

【0025】

【化9】



(9)

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* 【0028】式(10)において、R¹は、前記一般式

(1)におけるものと同様の基である。R²は、例えば

下記式(11)～(13)で示される基等の炭素数1～

12の分枝状アルキル基、下記式(14)で示される

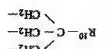
基等の分枝状ポリ(アルキレンオキシ)基又は下記式

(15)で示される基等の分枝状ポリシロキサン基等が挙

げられる。Jは、3又は4である。

【0029】

【化11】



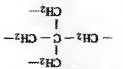
(11)

【0030】式(11)において、R¹¹はメチル基、

エチル基又はプロピル基等の低級アルキル基である。)

【0031】

【化12】



(12)

【0026】3～4個のオキセタン環を有する化合物と

しては、下記一般式(10)で示される化合物等が挙げ

られる。

【0027】

【化10】



(10)

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【0032】

【化13】



(13)

【化14】

【化14】



(14)

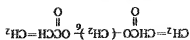
【0033】

【化14】



【0034】式(14)において、Jは1～10の整数である。)

19



(38)

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【0095】・成分H(光ラジカル重合開始剤である下式(39)の化合物)

* 【化39】

(39)



【0097】
【表2】

硬化性 (VX)	耐水性	柔軟性	光沢	耐擦傷 性
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実施例1	7	○	○	○
実施例2	6	○	○	○
実施例3	3	○	△	○
実施例4	6	○	○	○
実施例5	2	○	○	○
実施例6	3	○	○	○
実施例7	2	○	○	○

30

比較例1	3	△	△	△
比較例2	未硬化	—	—	—
比較例3	8	×	×	×

【0098】

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フロントページの続き

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 NKX
 NKX
 技術表示箇所

* NOTICES *

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.*** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the activity energy-line hardening setup-of-tooling product for paper covering which consists of a compound which has an oxetane ring. The object for prizes is carried out in the field which manufactures paper and is used. In this specification, an acrylyl group or a methacryloyl group is expressed as an acrylyl group (meta).

[0002]

[Description of the Prior Art] While protecting itself or its printing surface on paper and raising blocking resistance, abrasion resistance, and abrasion-proof nature on it, coating treatment may be performed to the surface in order to acquire gloss. Conventionally, methods, such as what is called vinyl length, a press coat, and printed laminate, were carried out to such processing. However, since these work processes are accompanied by complicatedness, in recent years, the method of using the activity energy-line hardening setup-of-tooling product which can stiffen a constituent for a short time is used. However, although unsaturated polyester, epoxy acrylate, or urethane acrylate hardened by an activity energy-line start radical polymerization is used, most activity energy-line hardening products for the conventional paper covering, These suited the tendency for the influence of the polymerization inhibition by oxygen to be great for the use of paper covering with as thin film thickness as several [around] micrometers, and to spoil the hardenability of a constituent, the abrasion-proof nature of the coat obtained, etc. for it generally at the time of hardening.

[0003] As activity energy-line hardening art other than an activity energy-line start radical polymerization, activity energy-line start cationic polymerization art is put in practical use. Since activity energy-line start cationic polymerization in particular is not checked by oxygen, there is no restriction that it must carry out under an inert atmosphere, and it has the

advantage that a prompt and perfect polymerization can be performed in the air. Activity energy-line start cationic polymerization art was concentrated on the polymerization of two kinds of monomers called an epoxy resin and vinyl ether till today. Especially a photorealist epoxy resin is excellent in an adhesive property, and the coat has heat resistance and good chemical resistance. However, in the conventional photorealist epoxy resin, since it had a defect in which photopolymerization speed is comparatively slow, it was not able to be used in the use asked for prompt photo-curing. The photorealist epoxy resin had that pliability was not enough, when it was used for the use of paper covering. On the other hand, photorealist vinyl ether is volatile, or there are many strong things of a bad smell, the contraction at the time of hardening is accepted as compared with photorealist epoxy, and there is much what has not enough adhesion.

[0004]

[Problem(s) to be Solved by the Invention] This invention persons inquired wholeheartedly in order to find out the activity energy-line hardening setup-of-tooling product for paper covering where the coat has gloss and which is excellent in hardenability, and excels [coat] in adhesion, abrasion-proof nature, and pliability further which solves these problems.

[0005]

[Means for Solving the Problem] By various examination, a constituent which consists of cyclic ether which has a specific structure found out that the above-mentioned technical problem was solvable as a constituent for activity energy-line hardening types for paper covering, and this invention persons completed this invention. Namely, an activity energy-line hardening setup-of-tooling product for paper covering in which the 1st invention consists of a

compound and an optical cationic initiator which have 1-4 oxetane rings, An activity energy-line hardening setup-of-tooling product for paper covering of the 1st invention or the 2nd invention which contains further a compound in which the 3rd invention has a vinyl ether group, The 4th

invention is an activity energy-line hardening setup-of-tooling product for paper covering of the 1st invention, the 2nd invention, or the 3rd invention which contains further a compound and an optical radical polymerization initiator which have an acrylyl group (meta). Hereafter, this

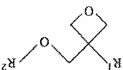
invention is explained in detail.

[0006] ○ A compound which has an oxetane ring used by compound this invention which has 1-4 oxetane rings has 1-4 oxetane rings. When a compound which has five or more oxetane rings is used, pliability is lost by hardening layer of a constituent and a cracking crack may be caused by bending. Various things can be used for it if a compound which has an oxetane ring used by this invention is a compound which has 1-4 oxetane rings. As a compound which has one oxetane ring, a compound etc. which are shown with a following general formula (1) are

mentioned.

[0007]

[Formula 1]



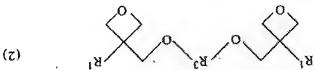
(1)

[0008] In a formula (1), R^1 is the alkyl group of 1-6 carbon numbers, such as a hydrogen atom, a methyl group, an ethyl group, a propyl group, or a butyl group, the fluoro alkyl group of 1-6 carbon numbers, an allyl group, an aryl group, a furyl group, or a thienyl group. R^2 The alkyl group of 1-6 carbon numbers, such as a methyl group, an ethyl group, a propyl group, or a butyl group, 1-propenyl group, 2-propenyl group, a 2-methyl-1-propenyl group, The alkenyl group of 2-6 carbon numbers, such as a 2-methyl-2-propenyl group, 1-butenyl group, 2-butenyl group, or 3-butenyl group, The basis which has aromatic rings, such as a phenyl group, benzy, fluoro benzy, a methoxybenzyl group, or a phenoxyethyl group, The alkyl carbonyl group of 2-6 carbon numbers, such as an ethyl carbonyl group, a propyl carbonyl group, or a butyl carbonyl group, The alkoxycarbonyl group of 2-6 carbon numbers of an ethoxycarbonyl group, a carbodropoxy group, or a butoxycarbonyl group, Or it is N-alkyl carbamoyl group of 2-6 carbon numbers, such as an ethylcarbamoyl group, a propylcarbamoyl group, a butylcarbamoyl group, or a pentylcarbamoyl group, etc.

[0009] Next, as a compound which has two oxetane rings, a compound etc. which are shown with a following general formula (2) are listed.

[0010]

[Formula 2]



(2)

[0011] In a formula (2), R^1 is the same basis as the thing in said general formula (1), R^3 , for example A line or the letter alkylene groups of branching, such as ethylene, a propylene group, or a butylene group, Lines, such as a poly(ethyleneoxy) group or a poly (propyleneoxy) group, or the letter poly (alkyleneoxy) group of branching, They are an alkylene group containing lines, such as a propylene group, a methylpropylene group, or a butylene group, or the letter unsaturated hydrocarbon group of branching, a carbonyl group, and a carbonyl group, an alkylene group containing a carbonyl group, or an alkylene group containing a carbamoyl group. R^3 is also a multivalent basis chosen from the basis shown with the following formula (3), (4), and (5).

[Formu



[0014]



[9100]

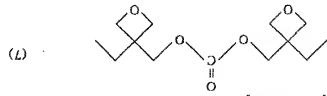


[8100]



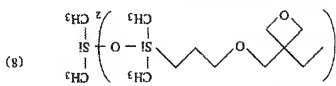
[0019] In a formula (6), R^8 is an alkyl group of 1-4 carbon numbers, such as a methyl group, an ethyl group, a propyl group, and a butyl group, or an aryl group, m is an integer of 0-100. As an example of a compound of having two oxetane rings, the compound etc. which are shown with the following formula (7) and (8) are mentioned.

[0020]
[Formula 7]



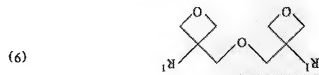
[0021] The compound shown by a formula (7) is a compound whose R^1 is an ethyl group and whose R^3 is a carboxyl group in a formula (2).

[0022]
[Formula 8]



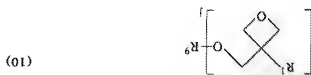
[0023] In a general formula (2), R^1 of the compound shown by a formula (8) is [an ethyl group and R^3] the compounds a methyl group and whose n , R^6 and R^7 are 1 by a formula (5). [0024] In the compound which has two oxetane rings, there is a compound shown with a following general formula (9) as desirable examples other than the above-mentioned compound. In a formula (9), R^1 is the same basis as the thing in said general formula (1).

[0025]
[Formula 9]



[0026] As a compound which has 3-4 oxetane rings, the compound etc. which are shown with a following general formula (10) are mentioned.

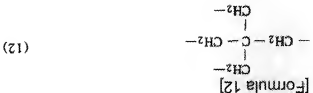
[0027]
[Formula 10]



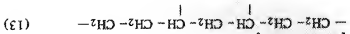
[0028] In a formula (10), R^1 is the same basis as the thing in said general formula (1). Letter polysiloxy groups of branching, such as a basis shown with the letter poly (alkyleneoxy) group or branching or following formulas (15), such as a letter alkylene group or branching of the carbon numbers 1-12, such as a basis R^9 is indicated to be, for example by following formula (11) - (13), and a basis shown with a following formula (14), etc. are mentioned. j is 3 or 4.



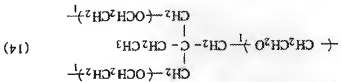
[Formula 11]
[0031]



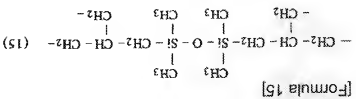
[Formula 12]
[0032]



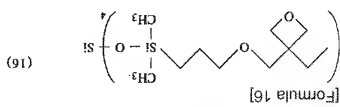
[Formula 13]
[0033]



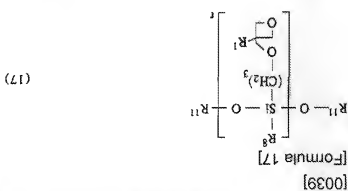
[0034] In a formula (14), j is an integer of 1-10.]
[0035]



[0036] As an example of a compound of having 3-4 oxetane rings, the compound etc. which are shown with a following formula (16) are mentioned.

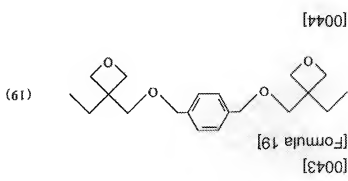
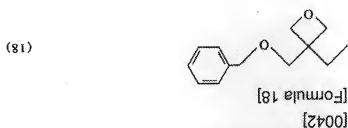


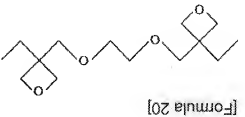
[0038] As an example of a compound which has 1-4 oxetane rings except having described above, there is a compound shown with a following formula (17).



[0040] In a formula (17), R⁸ is the same basis as the thing in a formula (6). R¹¹ is the alkyl group or trialkylsilyl groups of the carbon numbers 1-4, such as a methyl group, an ethyl group, a propyl group, or a butyl group, and r is 1-4.

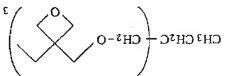
[0041] There is a compound shown below as a desirable example of the oxetane compound used by this invention.





[Formula 20]

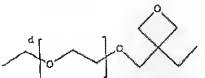
(20)



[Formula 21]

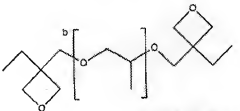
(21)

[0046] The compound which has 1-4 oxetane rings which have the with a molecular weight of about 1000 to 5000 amount of polymers besides these is also mentioned. As these examples, the following compounds are mentioned, for example.



[Formula 22]

(22)



[Formula 23]

(23)

[0048] Here, p is 20-200.

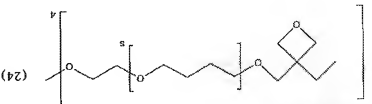
[0049]

[Formula 23]

[0050] Here, q is 15-100.

[0051]

[Formula 24]

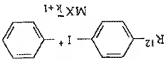


[0052] Here, s is 20-200.

[0053] Various things can be used as an optical cationic initiator used with a constituent of optical cationic initiator this invention. Diaryliodonium salt and a triarylsulfonium salt are mentioned as a thing desirable as these initiators. A typical optical cationic initiator is shown below.

[0054]

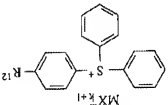
[Formula 25]



(25)

[0055]

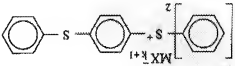
[Formula 26]



(26)

[0056]

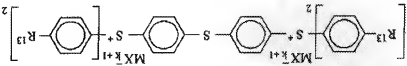
[Formula 27]



(27)

[0057]

[Formula 28]



(28)

[0058] R¹² is a hydrogen atom, an alkyl group of the carbon numbers 1-18, or an alkoxy group

of the carbon numbers 1-18 among a formula, and R¹³ is a hydrogen atom, a hydroxyalkyl group, and a hydroxyalkoxy group, and is hydroxyethoxy bases preferably. M -- metal -- it is group, preferably -- X -- halogen -- it is fluoride preferably, and k is a metal valence, for example, in the case of antimony, it is 5. When making the compound which has the

compound and/or vinyl ether group which have an epoxy group further in this contain as opposed to the compound which has an oxetane ring, an optical cationic initiator, it is preferred

to contain at 0.1 to 20% of the weight of a rate to those total quantities, and it is 0.1 to 10 % of the weight more preferably. When not filling to 0.1% of the weight, hardenability becomes less enough, when exceeding another side and 20 % of the weight, a light transmittance state becomes poor, uniform hardening may not be able to be performed or the smooth nature of a paint film surface may be lost.

[0059] In each of above-mentioned chemical formulas showing a compound or an optical cationic initiator which has 1-4 oxetane rings, each basis expressed with the same sign that exists in one molecule may be mutually the same, or may differ.

[0060] Other ingredients can be blended with a constituent of other compound this inventions if needed besides the above-mentioned essential ingredient. The 2nd invention of this invention is an actively energy-line hardening setup-of-tooling product for paper covering

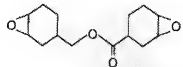
containing a compound which has an epoxy group further in a constituent of the 1st invention. In this case, a cure rate of a constituent is further improvable by making an epoxy compound contain in a constituent. Various things can be used as a compound which has an epoxy

group. For example, as an epoxy compound which has one epoxy group. As an epoxy compound which there are phenyl glycidyl ether, butyl glycidyl ether, etc., and has two or more epoxy groups, Hexanediol diglycidyl ether, tetraethylene glycol diglycidyl ether,

trimethylolpropane triglycidyl ether, bisphenol A diglycidyl ether, a novolac type epoxy compound, etc. are mentioned. It is preferred especially to use an alicyclic epoxy compound by this invention, for example, a compound etc. which are shown below are mentioned.

[0061]

[Formula 29]



(29)

[0062]

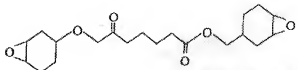
[Formula 30]



(30)

[0063]

[Formula 31]



(31)

[0064] In this case, as a blending ratio of a compound which has an epoxy group, five to 95 weight section is preferred to total quantity 100 weight section of the compound which has the 1-4 above-mentioned oxetane rings, and the compound which has an epoxy group.

[0065] The 3rd invention of this invention is an activity energy-line hardening setup-of-tooling product for paper covering containing a compound which has a vinyl ether group further in a constituent of the 1st invention. In this case, a cure rate of a constituent is further improvable by making a compound which has a vinyl ether group contain in a constituent. Various things can be used as a compound which has a vinyl ether group. For example, as a compound which has one vinyl ether group, hydroxyethyl vinyl ether, hydroxybutyl vinyl ether, dodecyl vinyl ether, propenyl ether propylene carbonate, cyclohexyl vinyl ether, etc. are mentioned. As a compound which has two or more vinyl ether groups, cyclohexane dimethanol divinyl ether, triethylene glycol divinyl ether, novolac type divinyl ether, etc. are mentioned. In this case, as a blending ratio of a compound which has a vinyl ether group, five to 95 weight section is preferred to total quantity 100 weight section of a compound which has the 1-4 above-mentioned oxetane rings, and a compound which has a vinyl ether group.

[0066] The 4th invention of this invention is an activity energy-line hardening setup-of-tooling product for paper covering containing a compound and an optical radical polymerization initiator which have an acrylyl group further (meta) in a constituent of the 1st invention. In this case, refining of adjustment of constituent viscosity and film hardness of a constituent can be performed by making a compound which has an acrylyl group (meta) contain in a constituent. (Meta) Various things can be used as a compound which has an acrylyl group. For example, as a compound which has one acrylyl group (meta), acrylate (meta) of phenol, nonyl phenol, and 2-ethylhexanol, acrylate (meta) of an alkylene oxide addition of these alcohol, etc. are mentioned. (Meta) As a compound which has two acrylyl groups, dimethacrylate of bisphenol A, isocyanuric acid, ethylene glycol, and propylene glycol, dimethacrylate of an alkylene oxide addition of these alcohol, etc. are mentioned. (Meta) As a compound which has three acrylyl groups, Pentaerythritol, trimethylolpropane, and Tori (meta) acrylate of isocyanuric acid, And there are Tori (meta) acrylate of an alkylene oxide addition of these alcohol, etc., and poly (meta) acrylate of pentaerythritol and dipentaerythritol, etc. are mentioned as a compound which has four or more acrylyl groups (meta). Conventionally publicly known acrylic system monomer oligomer, such as urethane acrylate which uses a urethane bond as a main chain, polyester acrylates which use an ester bond as a main chain, and epoxy (meta) acrylate which added acrylic acid to an epoxy compound, etc. are mentioned. In this case, as a blending ratio of a compound which has an acrylyl group (meta), five to 95 weight section is preferred to total quantity 100 weight section of a compound which has the 1-4 above-mentioned oxetane rings, and a compound which has an acrylyl group (meta). An optical radical polymerization initiator is blended with a constituent in the 4th invention of this invention. As an optical radical

polymerization initiator, can use various things and as a desirable thing, Benzophenone and its derivative, benzoin alkyl ether, 2-methyl[4-(methylthio) phenyl]-2-morpholino 1-propanone, Benzyl dimethyl ketal, 1-hydroxycyclohexylphenyl ketone, 2-hydroxy-2-methyl-1-phenylpropan-1-one, alkyl phenylglyoxylate, diethoxyacetophenone, and 2-benzyl-2-dimethylamino 1-(4-morpholinophenyl)-1-butane non, acyl phosphine oxide etc. are mentioned. As for content of these optical radical polymerization initiators, it is preferred that it is 0.01 to 20 % of the weight to a compound which has an acrylyl group (meta).

[0067] in this invention, one sort chosen from a compound which has a compound which has a said epoxy group carried out in a constituent of the 1st invention, a compound which has a vinyl ether group, and (meta-) an acrylyl group, or two sorts or more can also be blended. In this case, a compound which has the 1-4 above-mentioned oxetane rings which are hardenability ingredients as these blending ratios. It is preferred to make into five to 95 weight section of a compound which has 1-4 oxetane rings on the basis of total quantity 100 weight section of a compound which has a compound which has an epoxy group, a compound which has a vinyl ether group, and (meta) an acrylyl group.

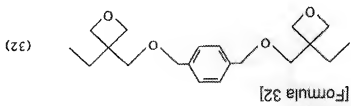
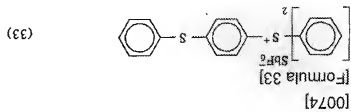
[0068] inerts like an inorganic bulking agent, a color, paints, a viscosity modifier, a processing agent, an organic solvent, and an ultraviolet-rays interception agent can be blended with a constituent of this invention in quantity to hardenability ingredient 100 weight section's hit 100 weight section.

[0069] A photosensitizer other than an optical cationic initiator or/and an optical radical polymerization initiator can be added to a constituent of this invention, and wavelength of a UV range can also be adjusted to it. As a typical sensitizer which can be used in this invention, he is Crivello. It is mentioned by what [J. V. Crivello, Adv. in Polymer Sci., 62, and 1 (1984)] are indicating, and specifically, There are pyrene, perylene, an acridine orange, a thioxan ton, 2-chloro thioxan ton, a benzothavin, etc.

[0070] O A manufacturing method in particular of a constituent of directions-for-use this invention is not limited, but is obtained by accepting an essential ingredient or an essential ingredient, and necessarily for this invention, and stirring or mixing other ingredients by a method usually performed. The directions for a constituent of this invention should just follow a method currently conventionally performed by covering of paper. For example, use paper as a substrate and with a coating method of a curtain flow coat, a roll coat, or a spray coat. Or a method of applying a constituent of this invention to paper, and irradiating with and stiffening an activity energy line with printing methods, such as offset, photogravure offset, or offset, etc. are mentioned. Paper etc. by which the surface other than a regular paper which can use paper of a substrate which is the target of this invention for various things, for example, uses cellulose as the main ingredients was processed with polyethylene, polyvinyl chloride, polypropylene, polyester, polycarbonate, or polyimide are mentioned. Although what is

[0075]- Coating of the evaluation profitable **** constituent is carried out by a thickness of 10 micrometers on art paper, the bottom of a mercury lamp was repeated and passed on condition of conveyor speed 10 m/min in a 10-cm position from under the high-pressure mercury lamp of 80W [cm] and a condensed type, and this was stiffened. The following evaluations were performed about the constituent and coat which were obtained. The result is shown in the following table 2.

[0076] O Passing time (number of times of passage) until adhesiveness disappears from the



[Example] An example and a comparative example are given to below, and this invention is explained more concretely. The part in each following example is a weight reference.

[0072] 100 copies of following compounds (32) (henceforth the ingredient A) which have the two following oxetane rings as a compound and which has a manufacture oxetane ring of an example 1- constituent, And stirring mixing of four copies of following compounds (33) (henceforth the ingredient G) was carried out as an optical cationic initiator, and the activity energy-line hardening setup-of-tooling product for paper covering was manufactured.

[0071] Invention, it is preferred to use ultraviolet rays for hardening of a constituent.

is preferred, and is 100-300 eV more preferably. Since a cheap device can be used in this invention, a resonance transformer type is mentioned, and has 50-1000-eV energy as an electron beam equipment can be used, for example, a cockloft WARTOSHIN type, a BANDE graph type, or an arc lamp is mentioned. When making it harden with an electron beam, what various irradiation vapor lamp, a metal halide lamp, a xenon lamp, an electrodeless discharge lamp, or a carbon vapor lamp is mentioned. Various things can be used as a light source which can be used when making it harden by ultraviolet rays, for example, application of pressure or a high-pressure mercury-mentioned. As an activity energy line, ultraviolet rays, X-rays, an electron beam, etc. are to a use to be used, as desirable thickness, it is 1-20 micrometers, and is 1-5 micrometers necessary is just to also choose thickness of a constituent of this invention suitably according

surface by the hardenability above-mentioned curing conditions estimated.

[0077]O In accordance with the X cut tape method of JISK 5400, adhesion was evaluated for the adhesion profitable **** coat.

O in Table 2, **, and x show a following meaning.

O in the evaluation point of 10 or 8**:JISK 5400, the evaluation point of 6 or 4X:JISK 5400 is [the evaluation point of :JISK 5400] 2 or 0. [0078]O The film surface was made into the table for the paper covered with the constituent coat of pliability this invention, the bend test was done using an axis 10 m in diameter, and viewing estimated the state of the coat of a flection.

O in Table 2, **, and x show a following meaning.

O : -- **: which does not almost have a crack -- a crack is looked at by whole x: a crack is seen [whole] in part [0079]O About the surface of the gloss profitable **** coat, the gloss in 60 angles was measured with the glossmeter. O in Table 2, **, and x show a following meaning.

O : less than [**:50-90% x:50%] exceeding 90% [0080]O The abrasion of the paint film surface was carried out by abrasion-proof nature steel wool #0000, it got damaged and the degree was observed by viewing.

O in Table 2, **, and x show a following meaning.

O : -- **: to which a crack sees and is hardly stopped -- x: to which a crack sees and is stopped slightly -- many cracks -- **** and ***** [0081]The constituent was manufactured like Example 1 except having used the ingredient of the presentation shown in the two to example 7 table 1. The activity energy-line hardening setup-of-tooling product for paper covering was manufactured like Example 1. Those results are shown in Table 2.

[0082]The constituent was manufactured like Example 1 except having used the ingredient of the presentation shown in the one to comparative example 3 table 1. The activity energy-line hardening setup-of-tooling product for paper covering was manufactured like Example 1 using the obtained constituent. The obtained coat was evaluated like Example 1. Those results are shown in Table 2.

[0083] [Table 1]

A	B	C	D	E	F	G	H
实例 1	100					4	
实例 2	50	50				4	
实例 3		25		75		4	
实例 4	75				25	3	1
实例 5	25		50		25	3	1
实例 6	50			25	25	3	1
实例 7	75		25			4	
实例 1				100		4	
实例 2			75	25		4	
实例 3					75	25	3

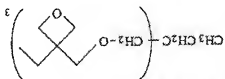
[0084] In Table 1, several show a part each. In Table 1, ingredient B-H shows the following

compounds.

[0085]-ingredient B [lower-type (34) compound which has three oxetane rings]

[9800]

[Formula 34]

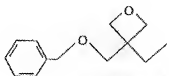


(34)

[0087]-ingredient C (lower-type (35) compound which has one oxetane ring)

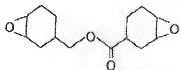
[8800]

[Formula 35]



(35)

[0089]-ingredient D [Lower-type (36) compound which has two epoxy groups]



(36)

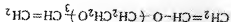
[Formula 36]

[0090]

[0091]-Ingredient E [Lower-type (37) compound which has two vinyl ether groups]

[0092]

[Formula 37]

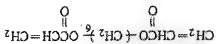


(37)

[0093]-Ingredient F [Lower-type (38) compound which has two acrylyl groups]

[0094]

[Formula 38]



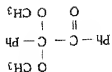
(38)

[0095]-Ingredient H (Lower-type (39) compound which is an optical radical polymerization

initiator]

[0096]

[Formula 39]



(39)

[Table 2]

[Translation done.]

[0098]
[Effect of the invention]The activity energy-line hardening setup-of-tooling product for paper covering of this invention has a quick cure rate, and the coat has gloss and is further excellent in adhesion, abrasion-proof nature, and pliability.
Practicality is very high.

	実施例 1	実施例 2	実施例 3	実施例 4	実施例 5	実施例 6	実施例 7	比較例 1	比較例 2	比較例 3
硬化性	○	○	○	○	○	○	○	△	—	×
密着性	○	○	○	○	○	○	○	△	—	×
柔軟性	○	○	△	○	○	○	○	×	—	△
光沢	○	○	○	○	○	○	○	×	—	×
耐摩擦性	○	○	○	○	○	○	○	△	—	×